



Letter from Hafner & Stippl to the European Patent Office, Munich, dated 15 February 2001

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Erhardtstraße 28

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Your Ref.:

Our Ref.: ABA/ST/20000067

File No.: PCT/DE 00/00485

Title: METHOD FOR CONTROLLING MICROORGANISMS IN A SUGAR-
CONTAINING, AQUEOUS PROCESS MEDIUM

Applicant: BetaTec Hopfenprodukte GmbH, Zuckerforschung Tulln GmbH

In response to the written office action of 16 November 2000:

The examination authority charged with the above-designated matter reaches, under section V of the above-mentioned office action, the conclusion that the object of claims 1 – 21 lacks novelty with respect to documents D1 – D4. According to the conviction of our side, the object of the present application, in the valid version of the claims, is new with respect to the prior art introduced into the process. Moreover, it is based upon an inventive step.

In particular:

I.

1. Novelty

The examination authority considers the object of the valid claims 1, 15, and 21 to be anticipated by D1 – D4, since the above-mentioned claims are supposed to contain no features that could be viewed as new with respect to the above-mentioned citations. An intended field of application of a claimed method (process media for extraction equipment in the sugar industry) is not viewed as a distinguishing feature of the method, since it requires no special type of application of the hop-acid preparations that would distinguish it from the applications known from the prior art.

In opposition to this, we offer the following for consideration: The claims at issue are process claims (as opposed to substance claims). Purpose-oriented method claims are at the same time application claims (cf. RiLi for the examination in the European Patent Office Part C, Chapter III 4.9).

In this connection, we make reference in addition to the RiLi for the examination in the European Patent Office Part C, Chapter IV 7.6, second paragraph, which reads:

“Further, attention is to be paid to the fact that a claim that is oriented towards the application of a known material for a particular purpose (second non-medical application) is to be interpreted to the effect that it contains this technical effect as a functional technical feature. With respect to novelty, such a claim is not to be objected to when this technical feature has not already earlier been made accessible to the public.”

For the present case, this means, in a concrete manner, that the claimed method for adjusting the content of microorganisms in a sugar-containing, aqueous process medium in extraction equipment of the sugar industry by application of hop acid, which having been brought to solution in an aqueous, alkaline medium is added to the process medium, is not previously known from the prior art according to D1 – D4 introduced into the process. None of the documents D1 – D4, that is to say, relates to the claimed application. This is even conceded by the examination authority in the above-mentioned office action.

As a consequence of this, the object of the present application, in the form claimed at present, is not anticipated through any of the citations introduced into the process.

II.

Inventive Step

1. General Prior Art

The present invention relates to the adjustment of the content of microorganisms in a sugar-containing, aqueous process medium of extraction equipment in the sugar industry by use of hop acid as the active substance, as described in the precharacterizing clause of claim 1, and thus to a very specialized field of technology.

In order to be able to convey a better concept of this application field, we are sending as **Document D** the publication "Neue Erkenntnisse beim Einsatz von Hopfenprodukten in der Zuckerindustrie" ["New Discoveries in the Use of Hop Products in the Sugar Industry"], Zuckerind. 122 (1997) No. 12, pp. 49 – 949. This publication shows the prior art in a somewhat more concrete manner than does the EP 0 681 029 A 2 already cited in the introduction to the specification.

During the production process of sugar, within the scope of the sugar-beet extraction a precise adjustment of the bacterial activity in the extraction tower must always be undertaken. This originally took place through application of the chemical formalin. The adjustment of the bacterial activity in the extraction tower is of particular significance for the quality of the extraction result.

D5 describes investigations in connection with the application of so-called base extract as a substitute for formalin for the purpose of the adjustment of the bacterial activity during the sugar-beet extraction.

Base extract relates to β -acid that is obtained as a by-product in the production of ISO extract.

As is evident from D5, introduction, right column, base extract has the following characteristics:

- Base extract is puncture-proof at room temperature;
- the melting region for base extract begins at approximately 50°C;
- base extract is insoluble in water.

In addition, in D5, cf. introduction, right column, reference is made to the fact that in the context of application technology the use of base extract in combination with an emulsifier has proved advantageous, since the melting region of the mixture becomes lower and application is facilitated. Further, a storing of base extract at room or cellar temperatures leads to only very slight losses of effectiveness.

Visible in Illustration 4 (attached as an enlarged copy) of D5 is a metering system for introduction of a base-extract emulsion. Represented in this Illustration 4, at the left side, is a heatable, high-grade steel vessel, into which the melted-down base extract is placed

and mixed with an emulsifier. In order to ensure the fluidity, the high-grade steel vessel is brought to the proper temperature, i.e. heated (D5, 942 lower left). The necessity of the heating of base extract or rather a base extract/emulsifier mixture follows additionally from D5, page 944, lower left and upper right. It is even necessary to heat the pipe from the storage container to the extraction tower in order to ensure a reliable operation of the process.

On page 948, right column, third from last paragraph, within the chapter "Discussion", the following is pointed out: *"a broadly scattered experimental activity with application of base extracts in additional factories, which activity is already emerging for the coming campaign, will hopefully bring new discoveries and improvements."* In other words, the addressed further development is in the direction of the further application of base extract in the sense of a maintaining of base extract.

2. Advantages

According to the present invention, instead of base extract, hop acid brought into solution in an aqueous, alkaline medium is added to the process medium; the pH value of the added solution is higher than the pH value of the process medium, and the hop acid in the process medium changes over from the dissociated form into the dissociated form. Resulting from this are the following significant advantages relative to the prior art:

Improved Effectiveness

Hop acid, which, brought into solution in an aqueous, alkaline medium, is added to the process medium, possesses a substantially better effectiveness in the arresting of bacteria in sugar-containing solutions than does base extract. This is presumably based on the fact that base extract must be added in conjunction with an emulsifier (since it is not soluble in water), whereby, due to the enveloping of the active components of the base extract by the emulsifier, the bacteria-destroying activity of the base extract is greatly reduced (see enclosed sketch).

From this follows, in addition, the fact that upon the addition of base extract the bacteria-destroying effect sets in more slowly than in the case of the claimed method, and a so-called shock dosing for the (if desired) most complete possible

forestalling of the bacterial activity is altogether more difficult to carry out. The effectiveness is improved by a factor of 3.

Smaller Amounts

Due to the increased effectiveness of the hop acid supplied according to claim 1, smaller amounts of hop extract are necessary for achieving the desired effect.

Considerably Simplified Process Technology

Since base extract – as described with reference to D5 – must be heated both during the preparation and also the feeding into an extraction tower in the sugar-processing industry, in order to ensure the flowing behavior, a considerable equipment-technology expense relating to the heating of the base extract is necessary, which in the case of the application of the method according to the invention according to claim 1 is completely obviated. The same is true for the storage.

Thus, the object of claim 1 ensures an improved effectiveness, a higher yield, as well as a considerable simplification of the process-technology realization. This is an unambiguous indication of the presence of an inventive step for the concretely claimed method.

3. Document D1

D1 relates to the use of hop acid in the brewing process, i.e. it has nothing to do with the processing of sugar. This hop acid serves here, primarily, the purpose of adjusting the bitter content of the beer and thus acts as a flavor former. More concretely, the teaching claimed in D1 aims at applying a mixture of irregularly formed potassium salt particles (i.e. solid matter) of dihydro-ISO- α -acids, hydroisoalpha acids (DHIA), as well as hexahydro-ISO- α -acids (HHIA), and this in a liquid, at least partially alkaline, aqueous solution of the potassium salts of the relevant, above-mentioned acids. The solution should not be supersaturated relative to the potassium salts of the above-mentioned acids (claim 1). Consequently, it is a matter of a two-phase mixture, which remains stable over a defined period of time (D1, page 11, lines 32 – 35) and which, through a slight

warming and stirring up, can be transformed into a solution that can be added to the beer in a simple manner (page 11, lines 10 –13).

Not only is the field of application, as well as purpose, of the addition of the hop acid completely different, but also the process-technology conditions of the brewing trade and the sugar-producing industry are in no way comparable. For the rest, concerning the efficiency of the hop acid, in the brewing process there is no difference whatever between the use of an aqueous, alkaline solution of hop acid and the use of a base-extract emulsion (according to D5). From this follows the fact that a surprising effect regarding the effectiveness of the use of base extract compared to an aqueous, alkaline solution is not evident from D1. Beyond this, D1 contains no details regarding the pH value of the added alkaline solution as well as of the process medium in the brewery process.

4. Document D2

D2 relates to the synthesis of hexahydro- β -acid, novel forms of the latter, as well as its application a cell-growth inhibiting substance.

D2 describes how in the scope of the production the β -acids are first of all exposed to an alkaline solution; here, used as solvents that cannot be mixed with water are hexanes, limoline, or fat-containing alcohols (column 2, lines 50 – 52). The catalyst poisons dissolving in this are subsequently drawn off with the solvent. The purified β -acid is then hydrated to form hexahydro- β -acid.

In column 3, lines 43 –46 under the chapter “The invention”, reference is made to the fact that the pure hexahydro- β -acid thus obtained can be used as a growth-inhibiting substance, and this in many forms, such as:

- a stable, alkaline, aqueous solution;
- a stable, alkaline solution in polyoles, as for example glycerin or propylene glycol;
- a crystalline substance;
- or a mixture of the above.

The equivalent likewise results from column 7, lines 37 – 43.

Nowhere in D2 is there any suggestion of using hexahydro- β -acid in the field of the production of sugar. Moreover, there are to be found in D2 no indications relating to the adjustment of the pH value of the aqueous solution of the principal acid relative to the process medium.

Finally, D2 – as listed above – specifies a complete series of different possibilities of the application of hexahydro- β -acid, of which the aqueous, alkaline solution is only one. D2 concerns itself mainly with the production of hexahydro- β -acid. In other words, D2 is not suitable for suggesting to the reader precisely the aqueous, alkaline solution of β -acid for the special method. Consequently, D2 cannot suggest to the specialist the object of the claimed invention.

5. Document D3

D3 relates to the production as well as application of light-stable (anactinic) hop material for flavor impairment in malt beverages (p. 2, line 1). Thus, D3 has nothing to do with the large-scale production of sugar.

In the scope of the production of the above-named hop materials, an aqueous, alkaline mixture of α -acids and cellulose hop material at a pH of over 10.5 is produced. Subsequently, the mixture is heated in a temperature range of 50°C - 85°, in order to convert the α -acids into ISO- α -acids. Subsequently, the pH value is reduced into the acidic range, in order to convert the salts of the ISO- α -acids from their dissociated form into the non-dissociated form, whereupon these accumulate on the cellulose hop material. The cellulose hop material is thereupon added to the brewing kettle (cf. claim 1). D3 is thus not relevant.

6. Document D4

This patent specification dating from the year 1963 also relates to the application of hops to the flavor impairment of beer (page 1, lines 16 – 28). It is true that in D4 (cf. claim 1), during the extraction process of α -acids, an aqueous, alkaline solution is produced; however, this is only for the purpose of separating the β -acid components from the α -acids. As follows from page 8, lines 1 – 13, the α - and β -acids are used in the brewing

process in powder form or in oil form. The application thus does not take place precisely in the manner described in claim 1.

In summary, it is therefore to be stated that documents D1 – D4 contain no suggestions that could have led the specialist, starting from the task presenting itself to him, in actuality to the claimed solution. To the extent, that is to say, that the question to be asked is not whether the specialist would have been capable of finding the claimed solution, but rather, whether the hints would have in actuality also led him to the claimed solution (could-would test).

Accordingly, we ask you to once again consider the suitability for protection of the invention within the scope of the present claims, taking into consideration the above explanations.

[signature]

Patent Attorney

enclosure

document D5

enlarged illustration 4 from D5

sketch

WRITTEN RULING
ATTACHMENT

International File No. PCT/DE00/00485

Regarding Point V

- 1) Reference is made to the following documents:

D1: WO-A-97 33971 (KALAMAZOO HOLDINGS, INC.)
D2: US-A-5 166 449 (TODD P.H. ET AL.)
D3: EP-A-0 339 147 (MILLER BREWING CO.)
D4: GB-A-1 058 975 (S.S. STEINER INC)

- 2) The present application does not meet the requirements of article 33(2) PCT, because the object of the independent claims 1, 15, and 21 is not new.

Document D1 discloses a method for controlling the content of bacteria in a sugar-containing, aqueous process medium in the production of beer by use of a concentrated, aqueous, alkaline solution of hop acid (iso- α -acid), which is present in the alkaline medium as potassium salt; here, the pH value of the hop acid solution lies in the range of 9.5 – 11 (cf., e.g., examples 1 and 2), and is thus higher than the pH value of the process medium, so that upon the addition of the hop acid solution to the process medium the hop acids are transformed from the dissociated form to the non-dissociated form (cf. p.4, line 12ff; p.5, line 31ff; and p.7, line 7ff).

Document D2 describes the application of an aqueous, alkaline solution of hexahydrolupulone (obtained through catalytic hydration of the corresponding β -acids) for the purpose of controlling the growth of bacteria (e.g. *Lactobacillus* spp.) in the presence of yeast (cf. column 3, line 7ff, line 43ff; and examples 5 and 6).

Document D3 discloses the application of an aqueous, alkaline, solution of hydrated iso- α -acids (obtained through isomerization and hydration of α -acids) in the brewing trade, the pH value of the hop acid solution lying in range of 8.5 – 9 (cf. p.3, line 16ff, line 40ff; and examples 2 and 3-B).

Document D4 discloses the application of aqueous, alkaline solutions of α -acids (cf. p.1, line 76ff; and p.2, line 107ff), iso- α -acids (cf. p.2, line 13ff), and β -acids (cf. p. 2, line 54ff;

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and p.3, line 5ff) in the brewing trade, the β -acid solutions exhibiting a bacteriostatic effect (cf. p.8, line 16ff). The preparations can be used in both the dissociated form and in the non-dissociated form (through acidification of the alkaline solution)(cf. p.8, line 1ff).

The object of the present claims 1, 15, and 21 is consequently anticipated by D1 – D4, since it contains no additional features that could be considered new in respect to the above-named citations. The intended field of application of the claimed method (namely, process media in extraction equipment in the sugar industry) is not considered to be a distinguishing feature of the method, since it demands no special type of application of hop acid preparations that would distinguish it from the applications known from the prior art (see instructions, PCT III-4.8; and IV-7.6).

- 3) The dependent claims 2 – 14 and 16 – 20 are only permissible in connection with independent claims whose object is both new and based on inventive activity (article 33(1) PCT). However, it appears that the dependent claims contain no additional features that, in combination with the features of any claim to which they refer, fulfill the requirements of the PCT in respect to novelty and inventive activity.

Regarding Point VII

In contradiction to the requirements of rule 5.1(a)(ii) PCT, in the specification neither the relevant prior art disclosed in documents D1 – D4 nor these documents are listed.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT – ATTACHMENT**

International File No. PCT/DE00/00485

Regarding Point V

1. Reference is made to the following documents:

D1: WO-A-97 33971 (KALAMAZOO HOLDINGS, INC.)
D2: US-A-5 166 449 (TODD P.H. ET AL.)
D3: EP-A-0 339 147 (MILLER BREWING CO.)
D4: GB-A-1 058 975 (S.S. STEINER INC)

- 2) The object of the present claims 1 – 21 is considered new (Article 33(2) PCT), since none of the documents cited in the search report anticipates a method for adjusting the content of microorganisms in a sugar-containing, aqueous process medium for extraction equipment in the sugar industry by application of hop acid. The intended field of application of the claimed method is considered a distinguishing feature of the method in respect to the prior art.

Document D1 discloses a method for controlling the content of bacteria in a sugar-containing, aqueous process medium in the production of beer by use of a concentrated, aqueous, alkaline solution of hop acid (iso- α -acid), which is present in the alkaline medium as potassium salt; here, the pH value of the hop acid solution lies in the range of 9.5 – 11 (cf., e.g., examples 1 and 2), and is thus higher than the pH value of the process medium, so that upon the addition of the hop acid solution to the process medium the hop acids are transformed from the dissociated form to the non-dissociated form (cf. p.4, line 12ff; p.5, line 31ff; and p.7, line 7ff).

Document D2 describes the application of an aqueous, alkaline solution of hexahydro-lupulone (obtained through catalytic hydration of the corresponding β -acids) for the purpose of controlling the growth of bacteria (e.g. *Lactobacillus* spp.) in the presence of yeast (cf. column 3, line 7ff, line 43ff; and examples 5 and 6).

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- Document D3 discloses the application of an aqueous, alkaline, solution of hydrated iso- α -acids (obtained through isomerization and hydration of α -acids) in a brewing process, the pH value of the hop acid solution lying in range of 8.5 – 9 (cf. p.3, line 16ff, line 40ff; and examples 2 and 3-B).

Document D4 discloses the application of aqueous, alkaline solutions of α -acids (cf. p.1, line 76ff; and p.2, line 107ff), iso- α -acids (cf. p.2, line 13ff), and β -acids (cf. p. 2, line 54ff; and p.3, line 5ff) in a brewing process, the β -acid solutions exhibiting a bacteriostatic effect (cf. p.8, line 16ff). The preparations can be used in both the dissociated form and in the non-dissociated form (through acidification of the alkaline solution)(cf. p.8, line 1ff).

- 3) The present invention does not fulfill the requirements of article 33(3) PCT, because the object of patent claims 1 – 21 is not based on inventive activity.

Document D1 is considered the nearest prior art with respect to the object of the present claims 1 – 21. It discloses a method for controlling the content of bacteria in a sugar-containing, aqueous brewing-process medium by application of a concentrated, aqueous, alkaline solution of hop acid (iso- α -acid). The object of the present claims 1 – 21 is thus distinguished from the object known from D1 only by the fact that the intended field of application is a sugar-containing, aqueous process medium for extraction equipment in the sugar industry. However, the controlling of the content of microorganisms in a process medium for extraction equipment in the sugar industry and the controlling of the content of microorganisms in a brewing-process medium represent merely two analogous situations, since in both cases it is a matter of inhibiting the growth of or combating microorganisms in the presence of sugar-containing, aqueous media. Moreover, the application of hop acid as a bacteriostatic agent in the field of the sugar industry demands no special type of the active substance and no adaptation of the method to the new application field that requires an inventive activity with respect to the application known in the prior art. Thus, it is considered obvious to make application of the previously

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known method for the adjustment of the content of microorganisms in a sugar-containing, aqueous solution brewing-process medium in an analogous situation, namely for controlling the content of microorganisms in a process medium for extraction equipment in the sugar industry (see instructions PCT IV-8.8 (A1)(v)).

Regarding Point VII

In contradiction to the requirements of rule 5.1(a)(ii) PCT, in the specification neither the relevant prior art disclosed in documents D1 – D4 nor these documents are listed.